Title
Robotic Therapy after Stroke and the Influence of Baseline Motor Status

Journal
STROKE, 40(4)

ISSN
0039-2499

Authors
Der-Yeghiaian, Lucy
Sharp, Kelli G
See, Jill
et al.

Publication Date
2009

P71

Robotic Therapy after Stroke and the Influence of Baseline Motor Status.

Lucy Der-Yeghiaian, Univ of California, Irvine, Irvine, CA; Kelli G Sharp, Chapman Univ, Orange, CA; Jill See, Neil S Abidi, Khoa Mai, Vu H Le, Steven C Cramer; Univ of California, Irvine, Irvine, CA

Introduction: Robotic therapies hold promise to reduce motor deficits after stroke. The current study (1) examined effects of a 2-week robotic therapy intervention on motor status, (2) compared a standard form of robotic therapy with a robotic approach based on the normal functions of premotor cortex, (3) examined clinical and functional MRI (fMRI) predictors of treatment gains, and (4) evaluated the influence of baseline motor status on these issues. **Methods:** Entry criteria included R hemiparetic stroke >3 months prior and Fugl-Meyer (FM) score 20–60 (out of 66, higher=better). Baseline MRI included two right hand fMRI tasks, one simple (grasp alternating with rest) and one complex (grasp or rest depending on a cue). After baseline assessments, subjects had 2 wks of treatment that included 24 hours of robot-based exercises plus virtual reality games. Half the subjects were randomly assigned to standard therapy, consisting of repeated grasp/release cycles, and half to premotor-based therapy, an approach that takes advantage of the computerized interface. With the premotor-based therapy, subjects had the same dose as standard therapy but with each cycle had to decide to either grasp, release, or rest based on visual cues. **Results:** The 15 subjects were 2.6 yr post-stroke, with mean age 61 and baseline FM score 35. For the 3 primary endpoints, significant gains were seen in FM at end of treatment (1.8 points, $p<0.005$) and 1 month post-treatment (2.1 points, $p<0.05$), Action Research Arm Test (ARAT) at 1 month post-treatment (1.2 points, $p<0.05$), but not in Box/Blocks. Among all subjects, the two therapy approaches produced similar gains. However, among the 6 higher functioning subjects (mean baseline FM=54) subjects, premotor therapy produced significantly greater FM score gains than standard therapy did at 1 month post-treatment ($p<0.005$), but no such difference was seen among the 9 lower functioning subjects (mean baseline FM score=23). Among all subjects, there were several significant behavioral and fMRI predictors of treatment gains. However, some predictions were in opposite directions according to baseline function. For example, larger motor cortex activation during the complex task predicted end-treatment FM gains, with the correlation being positive ($r=+0.76$) in lower functioning subjects but negative ($r=-0.88$) in higher functioning subjects. DISCUSSION: Overall, significant albeit modest gains in motor function were found. However, the extent to which a more challenging therapy, the premotor-based therapy, provided greater gains differed according to baseline motor status. In addition, several predictors of treatment response varied according to baseline motor status. Spontaneous brain repair events have been found to differ in relation to severity of stroke deficits. The current results support the idea that similar principles operate for treatment-induced repair.